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COMPREHENSIVE ASSESSMENT OF THE DELTA'S NATURAL CONDITIONS AND RESOURCES FOR THE IMPLEMENTATION OF COMPLEX DIFFERENTIATED MEASURES IN THE DESERTIFIED PART OF THE AMUDARYA DELTA

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ABSTRACT. This article provides a detailed scientific analysis of the natural conditions of the desert part of the Amudarya delta, rational use of resources, tugai ecosystems, ecological condition of irrigated lands and phytomeliorative and hydro-ameliorative conditions in the region, describes the proposals and recommendations for the future design of hydraulic structures. The importance of using the natural resources of the region in the development of the economy and focusing on optimizing the environmental situation is highlighted, and scientific conclusions are made on ensuring environmental sustainability.
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KEYWORDS: differential, assesment, hydraulic structures, universal, landscape, complexity principle, geosystem, genetic principle, dynamics, natural environment, delta, transformation, morphological, eluvial, hydromorphic, automorphic, intensive.

INTRODUCTION.

The article provides a detailed scientific analysis of the natural conditions of the desert part of the Amudarya delta, rational use of resources, tugai ecosystems, ecological condition of irrigated lands and phytomeliorative and hydro-ameliorative conditions in the region, describes the proposals and recommendations for the future design of hydraulic structures. The importance of using the region's natural resources in the development of the economy and focusing on optimizing the environmental situation is highlighted, and scientific conclusions are made on ensuring environmental sustainability in the article.

The natural conditions and resources of the Southern Aral Sea Basin are characterized by their complexity, diversity and variability in space and time. This feature requires the use of a differential approach in the use of the region's natural resources. That is, to identify areas where the conditions are favorable for use in certain sectors of the economy. Involving these regions in the balance of the national economy with their own resources will allow them to make maximum use of their resources at the same time and take appropriate measures to optimize the natural environment using natural conditions.

The diversity of natural conditions and resources of the region requires a differentiated assessment in terms of their use in different sectors of the economy. Such an assessment is the most optimal way in terms of optimizing the ecological balance of the Aral Sea region. This is because the assessment of areas for use in this or that area outlines the main concrete measures to simultaneously increase resource efficiency.

MAIN PART.

General assessment of the natural conditions and resources of the region in terms of their use in various sectors of agriculture, hydraulic structures, residential and industrial construction. It determines the application of a specific "universal" principle of their evaluation, based on the requirements for the objects being evaluated. From this point of view, in our opinion, the principle of complexity is more acceptable, taking into account all the features of the landscapes in the whole region. That is, the principle assumes that any area with natural boundaries is a geosystem to a certain degree. However, this geosystem can be adapted to one or another sector of the economy due to the nature of its structure.

The historical and genetic principle is based on the historical consideration of the state and dynamics of geosystems. That is, it applies in periods of formation of the natural environment and manifestation of modern features. In this regard, the stages of change in the geosystems of the Amudarya delta and the dried part of the seabed are characterized by their diversity, and for the most part they have almost the same transformation tendency. That is, it has an alluvial change in the morphological parts of the landscape. At these stages in

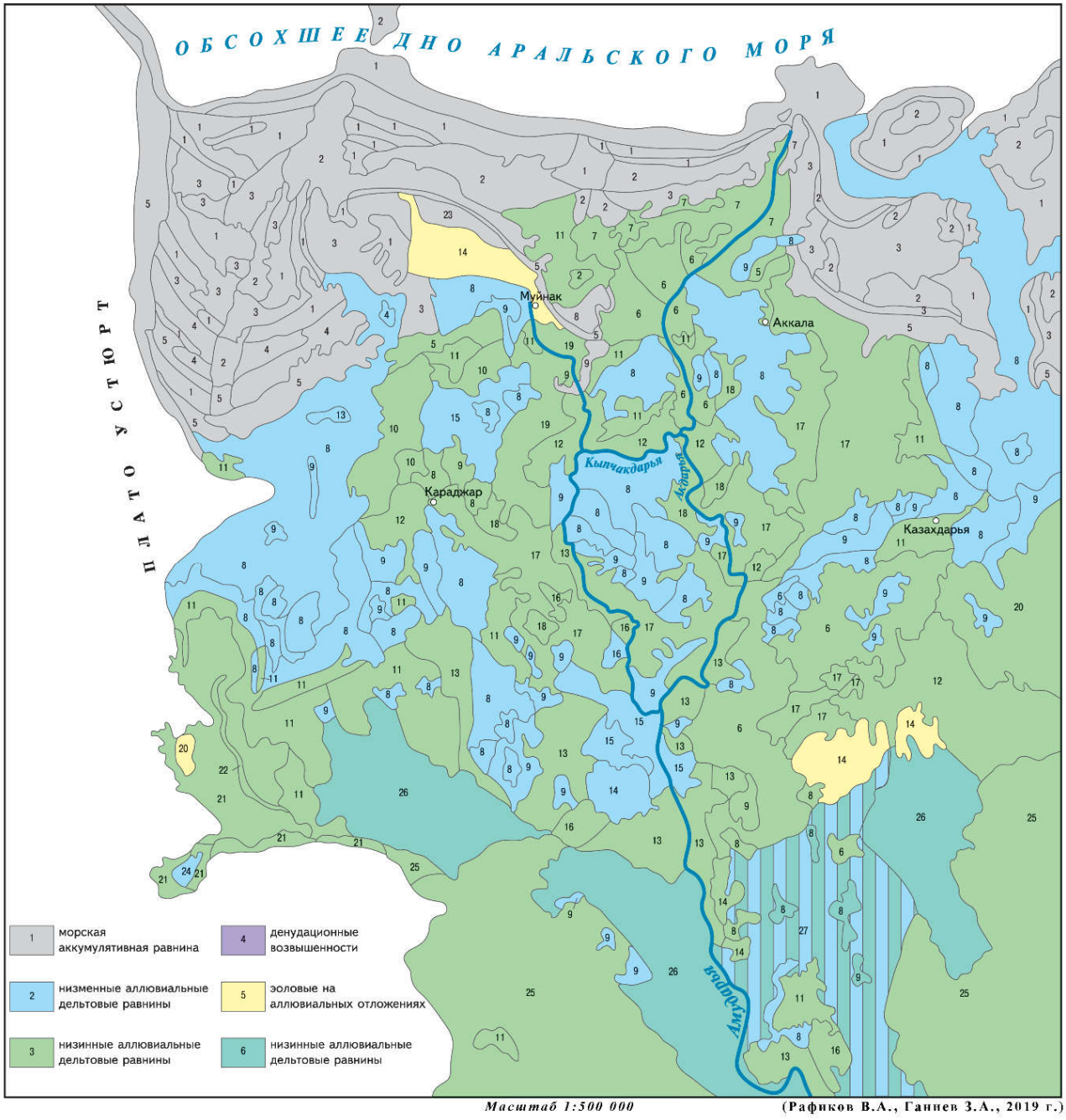
the development of geosystems (i.e., from hydromorphic to automorphic), various dynamic processes took place: mainly the intensive accumulation of salt - the stabilization of salt accumulation - surface salinity in some places. The last stage is accompanied by an intensification of eolian processes.

One of the main methods of assessing the natural conditions and resources of the region is the landscape-structural analysis of these areas, its use allows the identification of areas with different conditions and resources. This method is based not only on taking into account the suitability of the area for, for example, the organization of irrigation, livestock and other industries, but also to determine how convenient it is to implement certain forms of management.

A.G. Isachenko notes that the landscape has two functions. The first is the main means of meeting the needs of the environment, that is, as a function of life support or as part of living nature - light, heat, air, water, food. The second is a resource or production function, manifested in the ability of the landscape to provide social production with the necessary energy and raw materials. Hence, the landscape function has two main components or, more precisely, two potentials: ecological and resource. In addition, the ability to resist external, including man-made influences, is the potential for landscape sustainability, including the ability to self-cleanse from man-made harmful elements, to restore damaged landscapes.
If we proceed from this case, then three features of the area can be identified in the landscape contour of each type. That is, resource or production capacity, environmental conditions, sustainability against the effects of human economic activity. These natural properties of geosystems not only differ from each other, but also give a general free idea of the nature of macrogeosystems in the whole region. The superiority of this or that landscape in terms of structure provides general information about the natural conditions and resources of the area. In addition to the landscape-structural method, cosmic-indication, landscape-indication, evaluation, logical modeling, structure-dynamic array, and other methods were also used.

The dry part of the Southern Aral Sea and the bottom of the Aral Sea, although structurally and dynamically common plains, is characterized by some complexity. While geosystems are rapidly changing in space and time, on the other hand, due to the specificity and diversity of natural complexes, the use of their natural resources in industrial sectors is limited precisely due to the complexity of the natural environment. Therefore, the usable areas of geosystems are qualitatively diverse and less important in terms of quantity, where several forms of management are carried out.
Each sector of the economy has its own requirements for natural conditions and the nature of natural resources, it is important to take into account these characteristics, otherwise the appropriate efficiency in the use of local natural resources or sustainable operation of hydraulic structures and others will not be achieved. In this regard, in the assessment of natural conditions and resources, special attention should be paid to these features of the requirements of the types of sectors of the economy, engineering structures or facilities.
In the conditions of the Amudarya delta, the most favorable for the development of irrigated agriculture are intermodal plains with semi-hydromorphic and autorphic regimes for the development of hydrogeological processes, because they are watersheds between the river basins and also act as salt wash zones in marine-type deltas. At the same time, self-leveling groundwater levels below 5 m, the edges of the above-mentioned plains are more ameliorative, and as they move away from the terraces, the groundwater flow slows down and in some places becomes stagnant. The flat plains of the subaerial part of the Amudarya delta are geomorphologically favorable for the development of irrigated agriculture, but after the start of irrigation in areas with heavy mechanical deposits and steady flow, groundwater levels begin to rise rapidly (1.5-2 m / y). From 4-5 years of irrigation, the soil begins to be saline en masse, which requires increasing the density of the drainage network and regular saline washing.
For certain reasons (presence of large salt reserves in the subaerial zone, runoff zone, presence of salt marshes) the inter-river lowlands and the dry part of the sea are absolutely unsuitable for irrigation.

Submerged relief forms of the Amudarya delta are suitable for the formation of pastures and hayfields, reeds due to hydromorphic conditions, as they have favorable conditions for the accumulation of salt due to the constant flow of groundwater (map "Amudarya delta ecosystems"). Second, it is well known that 1,500 mm of moisture evaporates through transpiration during the growing season in the Amudarya delta.



Map 1. Amudarya delta ecosystems

That is why the large basins of the delta are covered with reeds as a result of the diversion of river and collector water. Of course, some of the lowlands can be used for rice cultivation, but limited water resources (river water) limit the development of this branch of irrigated agriculture. In the delta lakes and swamps of the delta, reeds can be grown for sucking on the basis of port irrigation.

The northern part of the Amudarya delta is a favorable area for the development of pastoralism, which is due to the proliferation of natural forage plants, which, even before the onset of desertification, had excellent pastures with high yields. Although pastures are currently declining, the area remains an object of pasture and livestock development.

High-yielding pastures correspond to the areas of irrigated lands and wooded shrubs and groves in hydromorphic ecosystems at the edges of lakes, reservoirs and streams. In the intermountain plains with automorphic conditions, there are low-yielding pastures due to the depth of the groundwater level. In such pastures, mesophytes are mixed with mixed sedges and annual saline. They are of little importance in pasture productivity in such sections of the delta.

The dried part of the Aral Sea is now completely unsuitable for grazing. This is due not only to the low productivity of pastures, but also to the migration of soil from the substrate. Pasture livestock can become a key factor in the development of eolian processes. On the other hand, pastures in the dry part of the sea are suitable for karakul sheep, but this is possible in the future when pastures are productive and it is safe to move the surface part of the soil.

As an ecosystem, the tree-shrub groves of the Amudarya delta have a special need for irrigation. Because the lack of flow in river networks does not allow the normal growth of tree species even in times of water scarcity. Some tugai completely dried up in the 80s, which is not only due to the lack of water in the river networks, but also due to the fact that the groundwater level falls below 10 m. In such severe environmental conditions, regular irrigation of tugai ecosystems is very important.

Regular irrigation works should be carried out along the main rivers and branches of the delta (Akdarya, Kipchakdarya, Toldikdarya, Kuhnadarya, Erkindaryo, Akboshli, Big and small Maliy Jonsiz, Madalozek, Injeneruzek, Kazakdarya, etc.). However, in the inter-basin plains there are a number of dry riverbeds front networks, now they have no water flow at all and on the eve of the disappearance of the groves along them, some massifs have dried up completely, groundwater level has dropped below 10 m everywhere. It is very important to prevent the migration of the substrate, increase pasture productivity, reduce wind strength, create favorable conditions for summer recreation of the population, as well as preserve the tugai, which is an excellent rich zoocenosis for nearby grazing herds. In summer, the air temperature in the groves is 4-5 ° C lower than in the open ground.

Irrigation of wooded groves allows to dramatically increase the productivity of pastures not only in them, but also in remote areas, up to 300 m from the streams, and sometimes at large distances, the groundwater level rises close to the surface. This creates conditions for the proliferation of mesophytes and hydrophytes. Given the important ecological and practical importance of wooded tugai, tugai ecosystems cannot be included in the economic cycle when using land resources, but they must be preserved as natural biocenoses.

There are many lakes in the Amudarya delta, most of which are now completely dry, the existing ones are not fully filled, and in years of low water they do not even get ¼ part of the water. As a result of not being able to pour water regularly, many lakes have been covered with mud for a long time, and their depth is very shallow. Given its hydroecological importance, some of these lakes need to be cleaned at a certain depth to reduce useless evaporation from water accumulation. It is necessary to fill a number of lakes of ecological importance for a certain depth and the surrounding plain with water, as well as to establish fishing and muskrat breeding. It is advisable to supply water to all major lakes located in the intertidal lowlands. Of course, in this case it is necessary to develop appropriate criteria to determine which lakes should be filled with water. Phytomelioration is of leading importance in the Aral Sea region, especially in the dry part of the seabed. The prevention of soil migration, the formation of mobile sands, and the transport of salts into the environment depend in many respects on the degree of solidification of the substrate. Since the 1980s, deflation has intensified in large areas (especially in the inter-basin plains) due to the drying up of tree-shrub groves. In the first years this process intensified along the streams without tugai vegetation, which led to the formation of areas of barkhan sands, which later began to spread everywhere. The zone of eolian sands associated with the drying up of the sea has been the object of development of eolian processes since the day it was formed. In this respect, the infiltration of sand towards the delta, as well as the transport of salt and salt dust particles from the salt marshes to the surrounding area by the wind, is very dangerous for the environment.

Among the phytomeliorative measures it is primarily concerned with the sands of the dried part of the sea, the

bald and residual salts of its interior. However, it is not very easy to create soil-protective forest zones here, as the wind on the sandy coastline is constantly blowing mainly from the north-east. It does not allow the cultivation of shrubs or tree species by sowing seeds. For this you need to plant seedlings. Planting of seedlings should be carried out when the soil moisture is at its highest, and all should be done manually, as planting using the technique is not profitable in the conditions of barren sands. The bald and saline parts of the surface of the dried bottom of the sea are strongly saline with chloride, sodium and sulfates. High levels of soil salinity complicate the normal development of seeds and plants. Therefore, it is advisable to carry out saline washing, at least in the upper part of the soil, for the vegetation of plants. Complex soils and ecological conditions require the establishment of tree species enclosures. It is important to choose the right type of xerophytes and halophytes and how to plant them.

THE RESULTS OBTAINED.

The assessment of the natural conditions and resources of the region shows that the existing geosystems are suitable for certain sectors of agriculture according to the nature and structural features. Here nature itself predicts where and what can be planted or grown, and we must follow it. However, in this respect it will be more difficult to conduct irrigated agriculture, which requires relatively good lands, depending on the reclamation status. In the Aral Sea region, almost all lands are more or less saline, but in this respect the land resources of the intertidal plains are more saline. However, even here, the accumulation of salt increases from the riverbed to the plains. In this case, in the highlands of the relief there are slightly fewer salts than in the lowlands, and so on. Therefore, when planning to use the land for the cultivation of certain crops, regardless of the introduction of drainage systems, their salt resistance should be taken into account. All this requires the implementation of a comprehensive detailed micro-zoning of lands, taking into account the suitability of lands suitable for irrigated agriculture for the cultivation of certain types of crops. Furthermore, zoning in order to assess land resources is a topical issue for the entire Southern Aral Sea region.

Water resources in the region are limited. The constant flow from Akdarya to the Aral Sea is not regularly observed due to the high water level of the Amudarya basin. In many water years, it provides sufficient water to delta ecosystems and allows the flow to flow into the sea. At the same time, the years of poverty are much less or not set at all than in the past, and the inter-valley lowlands do not provide enough water. All this requires the implementation of certain measures to ensure the regular irrigation of the Aral Sea ecosystems and to determine the amount of water reserves available in the Amudarya and Syrdarya basins to keep the sea level stable. Accurate calculations are needed to provide the region with guaranteed water resources and to divert the flow to the sea, on the basis of which it is necessary to take drastic measures on the water limit for the Aral Sea and the Aral Sea. Of course, in determining the volume of water resources should take into account the collector-drainage waters of the Aral Sea basin.

Pastures and hayfields should be located outside the lands developed for irrigated agriculture, and a complex of phytomeliorative works and restoration of degraded tugai should be carried out. In this regard, it is recommended to conduct a more detailed assessment of ecosystems (or geosystems) in order to increase the productivity of pastures, hayfields, identify areas for the establishment of soil-protective forest zones, drainage of dry streams to restore tree groves.

CONCLUSION.

The improvement of the ecologically destabilized situation in the Aral Sea region is largely due to the ecological and geographical basis. They provide for the mandatory consideration of various projects in the field of land reclamation, ie the justification of the nature of the ecological and geographical conditions of the area. Depending on the specific state, dynamics and trends of geosystems and ecosystems, it will be possible to justify certain measures. Ecological and geographical bases predetermine the possibility of using any area in one or another branch of agriculture, as an object of hydraulic structures, recreation, civil and industrial construction, etc.

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